10.3 Start Thinking

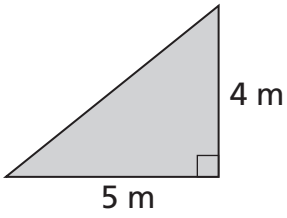
Draw a right triangle with leg lengths 3 centimeters and 4 centimeters. Find the length of the hypotenuse using the Pythagorean Theorem.

How can you use the Pythagorean Theorem if given the length of the hypotenuse and only one leg length of a right triangle? Use a hypotenuse length of 13 inches and a leg length of 5 inches to show how to rewrite the Pythagorean Theorem and solve for the other leg length.

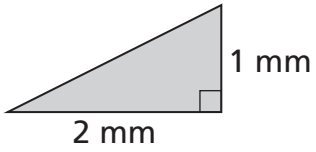
10.3 Warm Up

Find the missing length. If necessary, round to the nearest tenth.

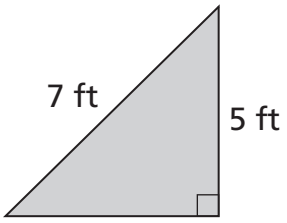
1.



2.



3.



4.

10.3 Cumulative Review Warm Up

Write an explicit rule for the recursive rule.

1. $a_1 = -2, a_n = a_{n-1} - 2$

2. $a_1 = 9, a_n = a_{n-1} + 11$

3. $a_1 = 17, a_n = -1.6a_{n-1}$

4. $a_1 = -3, a_n = 10a_{n-1}$

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10.3 Practice A

In Exercises 1–6, solve the equation. Check your solution.

1. $\sqrt{x} = 7$

2. $2 = \sqrt{x} - 3$

3. $\sqrt{t} - 4 = 2$

4. $\sqrt{h} + 10 = 21$

5. $5 - \sqrt{n} = 2$

6. $-6 = 4 - \sqrt{y}$

In Exercises 7–12, solve the equation. Check your solution.

7. $\sqrt{d + 2} + 3 = 7$

8. $\sqrt{m - 4} - 8 = -3$

9. $3\sqrt{x - 1} = 24$

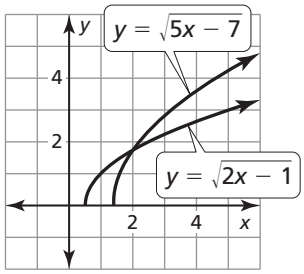
10. $7\sqrt{x + 6} = 14$

11. $-3 = \sqrt{2t + 5} - 4$

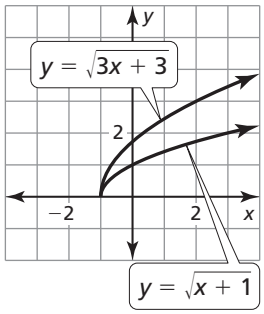
12. $5 = \sqrt{9p + 9} - 1$

In Exercises 13 and 14, use the graph to solve the equation.

13. $\sqrt{2x - 1} = \sqrt{5x - 7}$



14. $\sqrt{3x + 3} = \sqrt{x + 1}$



In Exercises 15–17, solve the equation. Check your solution.

15. $\sqrt[3]{x} = 3$

16. $10 = \sqrt[3]{8w}$

17. $\sqrt[3]{p + 10} = 4$

In Exercises 18 and 19, determine which solution, if any, is an extraneous solution.

18. $\sqrt{3x - 2} = x; x = 1, x = 2$

19. $\sqrt{x + 6} = x; x = 3, x = -2$

20. The radius r of a circle that goes through the point (x, y) is given by $r = \sqrt{x^2 + y^2}$.

a. Circle A has a radius of 5 centimeters and goes through the point $(x, 4)$. Find the x-coordinate of the point.

b. Circle B has a radius of 13 centimeters and goes through the point $(5, y)$. Find the y-coordinate of the point.

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10.3 Practice B

In Exercises 1–6, solve the equation. Check your solution.

1. $\sqrt{x} = 13$

2. $6 = \sqrt{x} - 2$

3. $\sqrt{t} + 14 = 20$

4. $-16 = 4 - \sqrt{y}$

5. $5\sqrt{n} - 10 = 15$

6. $3\sqrt{h} + 7 = 19$

In Exercises 7–12, solve the equation. Check your solution.

7. $\sqrt{q - 4} - 10 = -7$

8. $5\sqrt{m + 3} = 20$

9. $-4 = \sqrt{3x + 2} - 8$

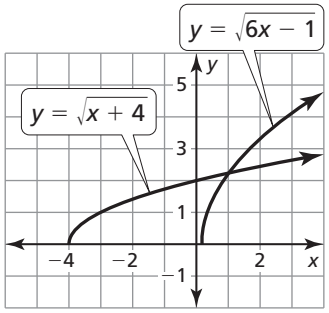
10. $3 = \sqrt{2x + 2} - 9$

11. $11 + 3\sqrt{2t + 5} = 23$

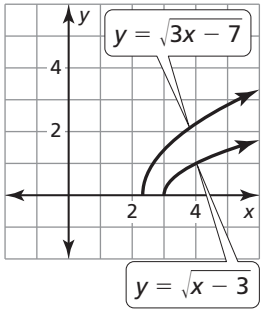
12. $5 - 2\sqrt{7p + 2} = 1$

In Exercises 13 and 14, use the graph to solve the equation.

13. $\sqrt{x + 4} - \sqrt{6x - 1} = 0$



14. $\sqrt{3x - 7} - \sqrt{x - 3} = 0$



In Exercises 15–17, solve the equation. Check your solution.

15. $\sqrt[3]{x - 9} = 2$

16. $-4 = \sqrt[3]{3w - 1}$

17. $\sqrt[3]{q - 3} = \sqrt{5q + 5}$

In Exercises 18 and 19, determine which solution, if any, is an extraneous solution.

18. $\sqrt{4t + 24} = -2t;\ t = 3,\ t = -2$

19. $\sqrt{36m - 36} = -3m;\ m = 2$

20. The radius r of a circle that goes through the point (x, y) is given by $r = \sqrt{x^2 + y^2}$. The y-coordinate of a point on the circle is 15 and the x-coordinate of the same point is 9 less than the radius.

a. Write an equation whose solution is the radius of the circle.

b. Find the radius of the circle.

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10.3 Enrichment and Extension

Solving Radical Inequalities

To solve radical inequalities, you must take a few factors into consideration, because square roots need to have a positive radicand, or value under the radical sign.

Example: Solve $3 + \sqrt{4x + 8} \leq 9$.

Step 1 Note that the radicand has to be greater than or equal to zero. So, set the expression under the radical sign greater than or equal to zero and solve for x.

$$4x + 8 \geq 0 \rightarrow 4x \geq -8 \rightarrow x \geq -2$$

Step 2 Solve the inequality by isolating the radical and squaring both sides.

$$3 + \sqrt{4x + 8} \leq 9 \rightarrow \sqrt{4x + 8} \leq 6 \rightarrow 4x + 8 \leq 36 \rightarrow 4x \leq 28 \rightarrow x \leq 7$$

Step 3 It appears that the solution is $-2 \leq x \leq 7$, but you must make sure by checking each interval. Choose numbers below, in the middle, and above the numbers in the solution and substitute the values into the original inequality.

$3 + \sqrt{4(-3) + 8} \leq 9 \rightarrow 3 + \sqrt{-4} \leq 9$ ✗

$3 + \sqrt{4(2) + 8} \leq 9 \rightarrow 3 + 4 \leq 9 \rightarrow 7 \leq 9$ ✓

$3 + \sqrt{4(8) + 8} \leq 9 \rightarrow 3 + 6.32 \leq 9 \rightarrow 9.32 \leq 9$ ✗

So, $-2 \leq x \leq 7$ is correct.

Solve the inequality.

1. $\sqrt{4x + 1} + 2 \leq 7$
2. $(14 - 2x)^{1/2} - 6 > 4$
3. $\sqrt{3x + 6} + 2 \leq 5$
4. $\sqrt{x + 4} \geq 2 + \sqrt{x}$
5. $-3 + \sqrt{8x + 1} \geq 4$

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10.3 Puzzle Time

Did You Hear About …

A	**B**	**C**	**D**	**E**	**F**
G	**H**	**I**	**J**	**K**	**L**
M	**N**	**O**	**P**		

Complete each exercise. Find the answer in the answer column. Write the word under the answer in the box containing the exercise letter.

43 **SO**	
343 **ALWAYS**	
24 **BROTHERS**	
2 **ME**	
16 **WHO**	
5 **GOT**	
34 **OLDER**	
36 **THE**	

Solve the equation.

A. $\sqrt{q} - 8 = -2$

B. $\sqrt{a} + 14 = 24$

C. $5 - \sqrt{s} = 1$

D. $6\sqrt{w} - 19 = -1$

E. $\sqrt{b - 7} + 8 = 14$

F. $3\sqrt{y + 5} = 18$

G. $-9 = \sqrt{6r + 21} - 24$

H. $10 + 4\sqrt{4p - 15} = 46$

I. $\sqrt{3x - 8} = \sqrt{x}$

J. $\sqrt{2c - 11} = \sqrt{\frac{c}{3} + 9}$

K. $\sqrt[3]{r} = 7$

L. $\sqrt[3]{17 - 5t} = -2$

M. $\sqrt[3]{z - 4} = \sqrt[3]{3z + 4}$

N. $d = \sqrt{7d - 6}$

O. $\sqrt{14 - 5u} = u$

P. The radius of a circle r (in inches) can be modeled by $\sqrt{12r + 13} = r$. What is the radius r of the circle?

100 **DUCK**	
4 **THAT**	
−4 **THE**	
31 **MANY**	
13 **DOWNS**	
1, 6 **HAND**	
12 **HE**	
9 **HAD**	